LIMITED SUBSURFACE SOIL INVESTIGATION AND VAPOR EXTRACTION TEST

FORMER MONDO CHROME FACILITY
4933 FIRESTONE BOULEVARD
SOUTH GATE, CALIFORNIA

Prepared for:

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1.0 INTRODUCTION

This report presents the results of a limited subsurface soil investigation and vapor extraction test conducted at the former Mondo Chrome facility located at 4933 Firestone Boulevard in South Gate, California, (Site)(Figure 1).

1.1 BACKGROUND

1.1.1 Historical Site Usage

The Site was used as a machine shop between 1972 and 1982 and as a chrome plating shop from approximately 1982 through 1990. The Los Angeles County Fire Department (LACFD) responded to a reported hazardous materials spill at the Site in July of 1990. The LACFD issued a violation to the Site occupant, who has apparently fled the area, for the improper storage of hazardous materials and the use of leaky storage vessels (Fugro, 1994).

1.1.2 Hazardous Materials Removal

Chem-Tech was hired to prepare a list of materials on the Site. Chemicals stored at the Site included the following: Alkaline metal solutions, chrome solutions, nickel solutions, flammable liquids, nickel /chrome sludge, acidic nickel solutions, solidified alkaline cleaner, and dry cyanide compounds. Tedesco Leasing, the Site owner, hired a contractor to remove and dispose of the hazardous materials (Fugro, 1994).

1.1.3 Subsurface Soil Investigation

Applied Geosciences drilled 11 borings with a hand auger and advanced 12 borings with a drilling rig in 1992. Selected soil borings were advanced to maximum depths of 40 feet below the ground surface (BGS). Groundwater was not encountered during this investigation. Soil samples were collected and analyzed for the presence or evidence of chemicals formerly stored at the Site which included volatile organic compounds (VOCs), selected metals, pH and cyanide. Soil sample results have been summarized in Table 1 (Fugro, 1994). Soil boring locations are shown on Figure 2.

Perchloroethylene (PCE) was detected in concentrations up to 41,000 parts per billion (ppb) in soil samples collected during the subsurface soil investigation. In general, concentrations of PCE decrease with depth and decrease from east to west across the Site. Concentrations of total chromium and hexavalent chromium were also detected in soil samples collected and analyzed as part of this investigation. Concentrations of all samples analyzed for chromium did not exceed respective total threshold limit concentrations or respective soluble threshold limit concentrations (Fugro, 1994).

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2.0 OBJECTIVES

The objectives of this work were to: 1) further assess the presence of chromium and cadmium in subsurface soils beneath the processing room of the Site; 2) assess the presence of VOCs in subsurface soils south of boring B10; 3) install a vapor extraction well, and; 4) conduct a vapor extraction test to assess the feasibility of vapor extraction as a remediation alternative for the Site.

3.0 SCOPE OF WORK

The scope of work, designed to provide the information needed to meet the objectives of the investigation, is as follows:

- Scheduling of drillers and other subcontractors, and the ordering of equipment, materials, and supplies;
- Implementation of a site-specific health and safety plan;
- Drilling of one soil boring and the installation of a vapor extraction well in that boring;
- Collection of selected soil samples from the boring and the field screening of soil samples for total undifferentiated volatile organic compounds (UVOCs), using the headspace analysis discussed in Appendix A;
- Collection of soil samples directly beneath the existing concrete slab in the former processing room;
- Installation of two vapor probes in the former processing room;
- Performance of a vapor extraction test using the newly installed vapor extraction well and vapor probes, and collection of vapor samples during the test;
- Chemical laboratory analyses of selected soil and vapor samples; and
- Data evaluation and report preparation.

A more detailed description of the field investigation and laboratory testing program is provided in Section 5.0.

4.0 SITE SETTING

4.1 SURFACE CONDITIONS

The Site is located on the north side of Firestone Boulevard approximately 300 feet to the east of the intersection of Atlantic Boulevard in South Gate, California. The Site is bound on the west by a clothing manufacturer, on the east by an auto parts reseller, on the north by Mason Street and a thread shop, and on the south by Firestone Boulevard and a motel. The Site topography slopes gradually to the southeast and has an elevation of approximately 110 feet above mean sea level (USGS, 1966).

4.2 REGIONAL GEOLOGY AND HYDROGEOLOGY

The Site is located within the Central Basin Pressure Area of the Downey Plain which is a subgroup of the Coastal Plain of Los Angeles County. The Downey Plain is a depositional feature consisting of alluvial fans from the Los Angeles River and Rio Hondo-San Gabriel River Systems (DWR, 1961). Subsurface soils encountered beneath the Site consist primarily of fine grained sediments such as clays and silts (Fugro, 1994). These types of sediments are characteristic of the depositional environment associated with meandering streams and rivers.

The Central Basin Pressure Area is characterized by the presence of many aquicludes, most notably the Bellflower aquiclude consists of low permeability silts and clays that separate near surface water from the deeper water bearing zones. The Bellflower aquiclude is estimated to be approximately 65 feet beneath the Site and have a thickness of approximately 60 feet in this area (DWR, 1961).

The Gaspur aquifer and the Lakewood Formation are water bearing units which are located beneath the Bellflower aquiclude beneath the Site. The Lakewood Formation has several water bearing units including the Artesia, Exposition, Gage and Gardena aquifers. The San Pedro Formation underlies the Lakewood Formation and has several water bearing units including the Hollydale, Jefferson, Lynwood, Silverado and Sunnyside aquifers (DWR, 1961).

The nearest groundwater well to the Site is located at an ARCO service station at 4861 East Firestone Boulevard in South Gate. The ARCO station is located approximately 0.2 miles to the west of the Site. Depth to groundwater is approximately 53 feet BGS at the ARCO station. Groundwater has been estimated to flow toward the south to southwest at the ARCO station (Fugro, 1994).

5.0 CURRENT INVESTIGATION

5.1 SUBSURFACE SOIL INVESTIGATION

5.1.1 Drilling and Soil Sampling

Soil boring VEW1 was advanced by FREY on June 27, 1996 at the location shown on Figure 2. The boring was hand excavated to four feet BGS to locate and avoid piping, and subsequently extended to a final depth of approximately 50.5 feet BGS. Boring VEW1 was drilled by Discovery Drilling Inc, of Carson, California under subcontract to FREY.

Soil samples were collected from boring VEW1 at 5-foot depth intervals. Soil cuttings were examined in the field for VOCs using a photoionization detector (PID). Selected soil samples were submitted to a state-certified hazardous waste testing laboratory for chemical analysis. Field procedures used in the advancement of boring VEW1 and collection of soil samples are presented in Appendix A. Boring logs and explanations regarding the format, terms and soil classification system used to describe the soil conditions are presented in Appendix B.

UVOC concentrations in excess of 100 parts per million were not detected in soil samples collected from boring VEW1. UVOC field measurements and notes are depicted on the field boring logs presented in Appendix B.

5.1.2 Vapor Extraction Well Installation

A vapor extraction well was installed in soil boring VEW1 by FREY personnel following its completion. Vapor extraction well VEW1 was constructed of two-inch diameter blank and 0.040-inch machine-slotted Schedule 40 PVC casing encased within a 6x16 mesh Monterey sand. Well VEW1 was installed to a final depth of approximately 45 feet BGS and screened from approximately 15 to 45 feet BGS.

The sandpack for well VEW1 extended approximately 2 feet above and below the screened interval. The annulus above and below the sandpack was backfilled with approximately 2 to 4 feet of hydrated bentonite chips. The remainder of the well was backfilled with a bentonite grout. The casing was capped with a slip cap and covered with sand and asphalt. A detailed description of the well construction procedures is presented in Appendix A. Vapor extraction well details are depicted on the boring log presented in Appendix B.

5.1.3 Limited Metals Sampling

Five holes were cored in the concrete floor of the former processing room and soil samples were collected from the cored holes in order to further assess the presence of selected metals in near surface soils. Soil samples FB1 through FB5 were collected immediately beneath the concrete with a hand auger and sampler at the locations shown on Figure 2. Soil sampling procedures are explained in Appendix A, and soil sample logs appear in Appendix B.

5.1.4 Vapor Probe Installation

Vapor probes VP1 and VP2 were installed on July 11, 1996 at the locations shown on Figure 2 with a low-clearance geoprobe rig. Vapor probes VP1 and VP2 were screened from approximately 19 to 20 feet BGS and 39 to 40 feet BGS. Vapor probes VP1 and VP2 were constructed of 1/4" diameter Tygon tubing to final depths of 40 feet BGS. ?

The sandpack for vapor probes VP1 and VP2 extended approximately 1 foot above and below each screened interval. The annulus above and below the sandpack was backfilled with hydrated bentonite sand. Approximately 3 feet of excess tubing remained on each probe to facilitate access for the vapor extraction test. A detailed description of the vapor probe construction procedures is presented in Appendix A, and boring logs depicting vapor probe construction are located in Appendix B.

5.1.5 Soil Disposal

Soils generated during the conduct of boring operations are being temporarily stored on-Site under plastic. Soil will be transported off-Site and disposed of at an appropriate facility at a later date.

5.2 VAPOR EXTRACTION TEST

A vapor extraction test was performed on well VEW1 by FREY on July 16, 1996 to assess the vapor yield of well VEW1 and to estimate the permeability of subsurface sediments. The test was performed by applying a vacuum to well VEW1 with a trailer-mounted blower until steady state conditions were reached. Two separate tests were performed with the application of vacuums equivalent to water columns of 20 and 40 inches of water (Tests 1 and 2, respectively). During each test, vacuum pressures were recorded at vapor probes VP1 and VP2, and vacuum pressures and air flow rates were recorded at the extraction well head. In addition, pressure recovery rates were measured after the vacuum blower was shut off. The blower effluent was directed through two, 200-pound carbon canisters in series to prevent the release of VOC-impacted gas into the atmosphere.

Soil vapor samples were collected during the vapor extraction test and screened for VOCs using a PID. Soil vapor samples VS1 and VS2, which were collected at the end of Test 1 (prior to recovery), and 25 minutes after the start of Test 2, respectively, were submitted to a state certified hazardous waste testing laboratory for chemical analyses. ?

flow was sampled at collector, & the inlet % = to soil gas data most likely

5.3 LABORATORY ANALYSES

Soil samples collected from boring VEW1 at depths of 5, 15, 25, 35, 45 and 50 feet BGS were analyzed for VOCs in general accordance with EPA Method No. 8010. Soil samples FB1 through FB5, collected immediately beneath the five concrete cores in the former processing room, were submitted to Calscience and analyzed for total chromium and cadmium in general accordance with EPA Method No. 6010A, and hexavalent chromium (chromium VI) in general accordance with EPA Method No. 3060. Selected soil vapor samples collected during the vapor extraction test were analyzed for VOCs by EPA Method No. TO14.

The chemical analyses of soil and vapor samples were performed by Calscience Environmental Laboratories, a state-certified hazardous waste testing laboratory located in Stanton, California. Copies of the chemical laboratory reports can be found in Appendix C.

6.0 RESULTS OF THE INVESTIGATION

6.1 SUBSURFACE SOIL INVESTIGATION

6.1.1 Subsurface Conditions

Subsurface materials penetrated during the drilling of boring VEW1 consisted of sands, silty sands, and silts from the ground surface to a depth of approximately 50 feet BGS. A clay layer was penetrated at approximately 50 feet BGS just prior to the termination of boring VEW1. Groundwater was penetrated during the drilling of boring VEW1 at approximately 45 feet BGS. The boring log located in Appendix B illustrates the soil lithology encountered during the drilling of boring VEW1.

6.1.2 Chemical Laboratory Analytical Data

Concentrations of PCE and/or trichloroethene (TCE) were detected in soil samples VEW1-15 (soil sample collected from boring VEW1 at a depth of 15 feet BGS), VEW1-25, VEW1-45, and VEW1-50. PCE and TCE concentrations ranged from 0.021 mg/kg (VEW1-45) to 0.212 mg/kg (VEW1-25) and 0.013 mg/kg (VEW1-25) to 0.070 mg/kg (VEW1-50), respectively. PCE and TCE were not detected in soil samples VEW1-5 and VEW1-35. No other VOCs were detected above the laboratory detection limits in any of the soil samples collected and analyzed from boring VEW1.

Chromium and cadmium were detected in soil samples FB1 through FB5 at concentrations ranging from 14.2 mg/kg (FB2) to 110 mg/kg (FB4) and 2.3 mg/kg (FB5) to 8.7 mg/kg (FB3), respectively. Hexavalent chromium (Chromium VI) was not detected in soil samples FB1 through FB5.

Laboratory analytical results of soil samples are summarized in Table 1. Laboratory and quality assurance/quality control reports appear in Appendix C.

6.2 VAPOR EXTRACTION TEST

6.2.1 Analytical Results of Vapor Extraction Test

Two vapor extraction tests were conducted on well VEW1 in order to assess the effectiveness of soil vapor extraction as a method of VOC removal from the vadose zone. Vapor extraction test (VET) data is summarized below.

	Test Number 1	Test Number 2
Extraction Well	VEW1	VEW1
Duration of Test (minutes)	75	70
Extraction Well Flow Rate (cubic feet per minute)	90	160
Vacuum at Extraction Well (inches of water)	20	40
PCE (parts per million)	31	32.8
Vacuum Response in Observation Probe (in. H_2O)		
VP1-20	0.38	2.80
VP1-40	2.50	2.05
VP2-20	0.25	1.60
VP2-40	1.20	1.40
Estimated Radius of Influence at 20 feet BGS	32	42
Estimated Radius of Influence at 40 feet BGS	52	80
Est. Intrinsic Permeability at 20 feet (Darcys)	246	69
Est. Intrinsic Permeability at 40 feet (Darcys)	55	110

Two estimates for intrinsic permeability have been given based on the lithology encountered during the installation of well VEW1. The shallower soils consist of mostly finer grained, lower permeability soils which contain some higher permeable, coarser grained sediments. The deeper soils consist of more permeable, coarser grained sediments with some finer grained, lower permeability soils.

Preferential flow paths will develop as a result of the differing soil types in the zone through which a flow of air would be directed during conduct of vapor extraction. These flow paths will effectively remove VOCs from the soil gas in some more permeable areas though advective transport but less effectively in low permeability areas by diffusion.

Calculation sheets presented in Appendix D show the equations used to determine the estimated radius of influence (R_i) and intrinsic permeabilities (k) along with calculations for Ri and k.

6.2.2 Chemical Laboratory Analytical Data

Two soil vapor samples were collected for laboratory analysis. The soil vapor sample collected during test number 1 contained tetrachloroethane (PCE) and trichloroethene (TCE) at concentrations of 31.0 parts per million per volume (ppmv) and 25.4 ppmv, respectively. The soil vapor sample collected during test number 2 contained PCE and TCE at concentrations of 32.8 ppmv and 26.0 ppmv, respectively. Lesser concentrations of benzene, toluene, ethylbenzene, total xylenes (BTEX) and breakdown products of PCE and TCE were detected in each soil vapor sample. Laboratory reports are presented in Appendix C and the results of the soil gas sample analyses are summarized in Table 2.

7.0 CONCLUSIONS

- Subsurface soils in the vicinity of soil boring VEW1 have been impacted by PCE and TCE at concentrations up to 0.212 mg/kg (25 feet BGS) and 0.070 mg/kg (50 feet BGS), respectively.

- Subsurface soils directly beneath the existing concrete slab of the former processing room contain detectable amounts of chromium and cadmium. Maximum chromium and cadmium concentrations of 110 mg/kg (FB4) and 8.7 mg/kg (FB3) were detected in this area. The laboratory concentrations do not exceed the total threshold limit concentrations (TTLC) of 2,500 mg/kg and 100 mg/kg for chromium and cadmium, respectively (CCR, 1994).

- Hexavalent chromium (Chromium VI) was not detected in soil samples collected beneath the existing concrete slab in the former processing room.

- Subsurface soil vapor in the vicinity of the former processing area contains concentrations of PCE, TCE, BTEX and other VOCs. Soil vapor samples collected during the vapor extraction test contained maximum concentrations of PCE, TCE and benzene of 32.8 ppmv, 26.0 ppmv, and 1.320 ppmv, respectively.

- The radius of influence was estimated to be approximately 37 feet in soils located at a depth of 20 feet BGS. The radius of influence was estimated to be approximately 66 feet in soils located at a depth of 40 feet BGS.

- Intrinsic permeabilities, calculated from the soil vapor extraction test data, are characteristic of well sorted sands (Fetter, 1980).

- Based on the data collected for this report, soil vapor extraction appears to be a feasible remediation option for this Site.

8.0 LIMITATIONS

The judgements described in this report are professional opinions based solely within the limits of the scope of work authorized, and pertain to conditions judged to be present or applicable at the time the work was performed. Future conditions may differ from those described herein, and this report is not intended for future evaluations of this Site unless an update is conducted by a consultant familiar with environmental assessments.

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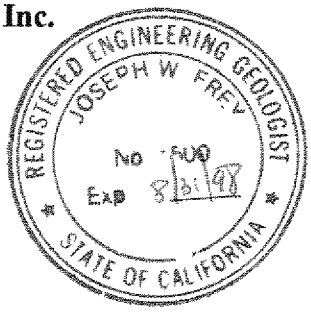
Environmental assessments provide an additional source on information regarding the environmental conditions of a particular property or facility. The report is a professional opinion and judgement to the Client, dependent upon FREY's knowledge and information obtained during the course of performance of the services.

Very truly yours,
FREY Environmental, Inc.



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USGS (United State Geologic Survey), 1966, 7.5-minute topographic quadrangle of Southgate, California, photorevised 1981.

TABLES

TABLE 1

CHEMICAL ANALYSES OF SOIL SAMPLES
MONDO CHROME FACILITY
SOUTH GATE, CALIFORNIA

(soil - milligrams per kilogram)

SAMPLE NUMBER	DEPTH (feet BGS)	DATE SAMPLED	PCE [1]	TCE [2]	CHROMIUM VI	CHROMIUM	CADMIUM
VEW1-5	5	06/27/96	<0.005	<0.005	NA	NA	NA
VEW1-15	15	06/27/96	0.054	<0.005	NA	NA	NA
VEW1-25	25	06/27/96	0.212	0.013	NA	NA	NA
VEW1-35	35	06/27/96	<0.005	<0.005	NA	NA	NA
VEW1-45	45	06/27/96	0.021	0.014	NA	NA	NA
VEW1-50	50	06/27/96	0.082	0.070	NA	NA	NA
FB1	1	06/27/96	NA	NA	<0.2	15.1	3.6
FB2	1	06/27/96	NA	NA	<0.2	14.2	2.3
FB3	1	06/27/96	NA	NA	<0.2	69.6	8.7
FB4	1	06/27/96	NA	NA	<0.2	110	2.7
FB5	1	06/27/96	NA	NA	<0.2	56.9	2.4

Notes:

1 PCE - Tetrachloroethene analyzed in general accordance with EPA Method No. 8010B.
2 TCE - Trichloroethene analyzed in general accordance with EPA Method No. 8010B.
3 Chromium VI analyzed in general accordance with EPA Method No. 3060
4 Chromium and Cadmium analyzed in general accordance with EPA Method No. 6010A.
5 NA - not analyzed

TABLE 2

CHEMICAL ANALYSES OF VAPOR SAMPLES
MONDO CHROME FACILITY
SOUTH GATE, CALIFORNIA

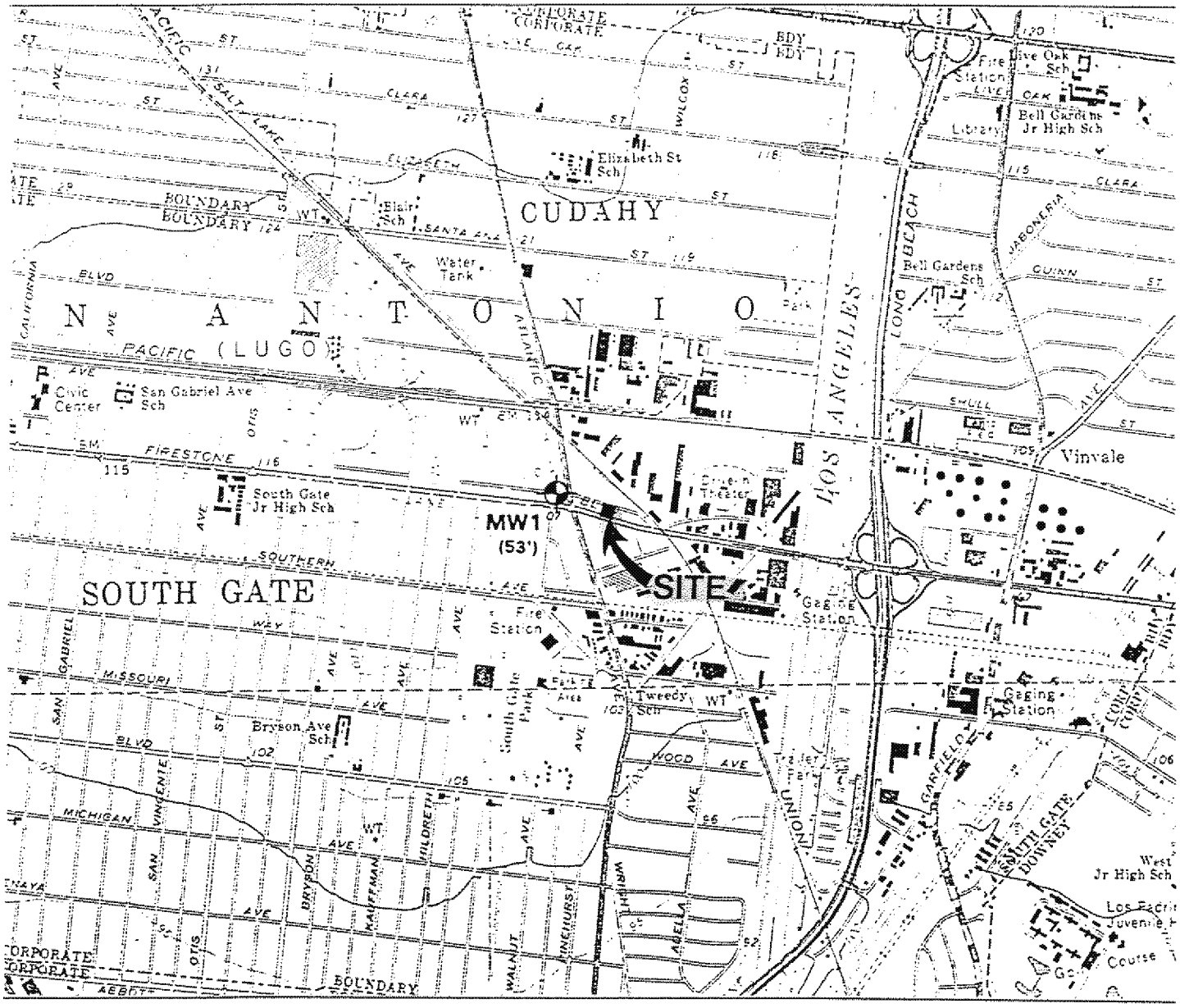
(vapor - (v/v) parts per billion - unless otherwise noted)

SAMPLE NUMBER	DATE SAMPLED	PCE [1]	TCE [2]	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES	1,1-DCE [3]	Cis 1,2-DCE [4]	4-ETHYL TOLUENE	1,2,4-TRIMETHYL BENZENE
VS1	07/16/96	31,000	25,400	1,550	6,990	430	3,650	400	360	220	420
VS2	07/16/96	32,800	26,000	1,320	6,310	550	7,460	180	350	840	1,290

Notes:

1) PCE = Tetrachloroethene
2) TCE = Trichloroethene
3) 1,1-DCE = 1,1-Dichloroethene
4) Cis 1,2-Dichloroethene

FIGURES



EXPLANATION

- ⌖ Groundwater well UNOCAL property
- **MW1** Well number
- (53') Depth to groundwater in feet MSL (1994)

NORTH

0 1/2 1

SCALE IN MILES

FORMER MONDO CHROME FACILITY
4933 FIRESTONE BOULEVARD
SOUTH GATE, CALIFORNIA

NOTES:

1) All locations and dimensions are approximate.
2) Base map from USGS 7.5 minute South Gate (1966, photorevised 1981), California topographic quadrangle.
3) Groundwater well data from FUGRO West, Inc., project no. 94-48-1320.

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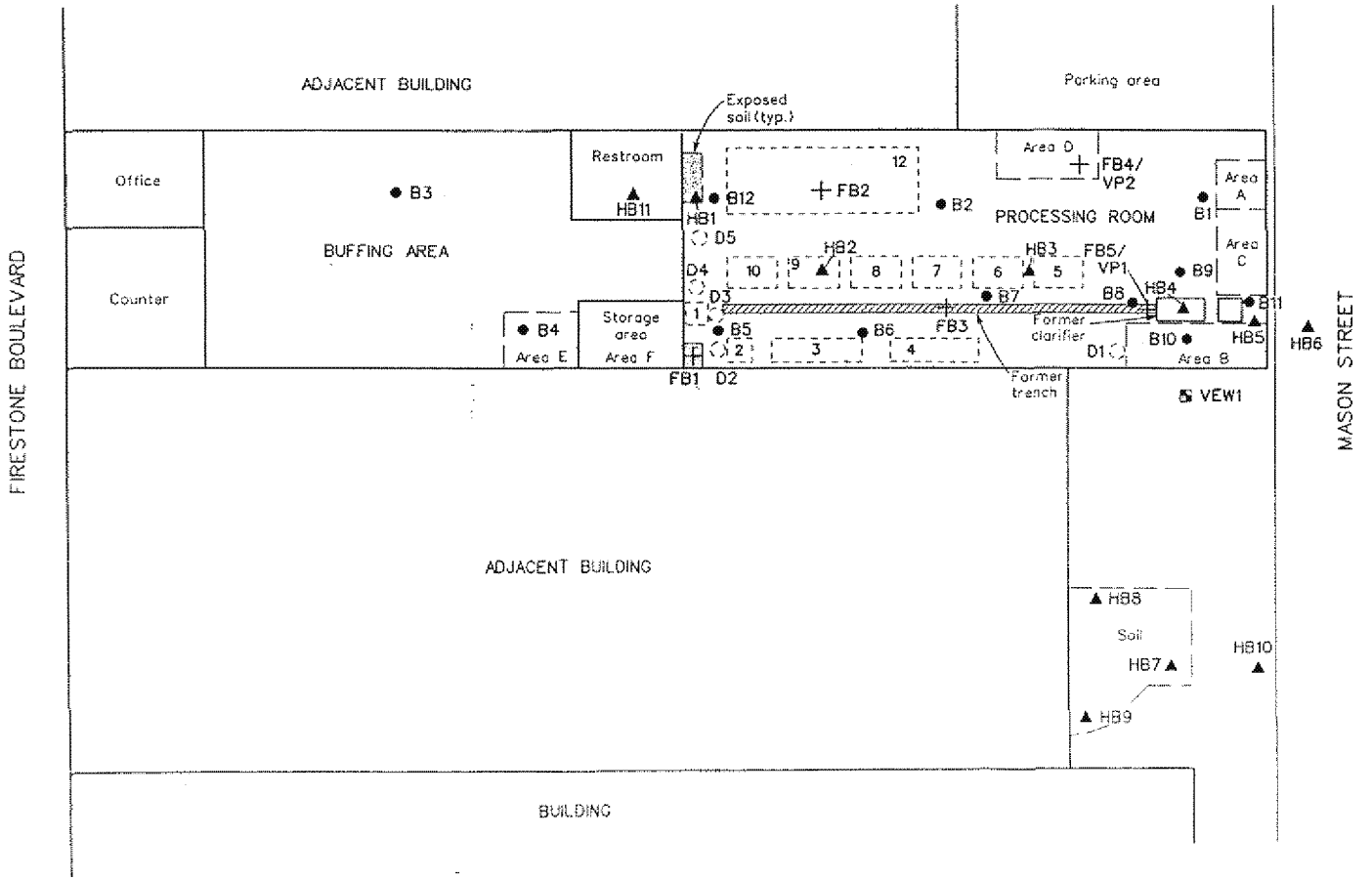
SITE LOCATION MAP

Date: **JANUARY 1996** Figure: **1**



EXPLANATION

5	FORMER ABOVE GROUND PROCESS TANK LOCATION
▲ HB6	HAND AUGER BORING LOCATION
● B11	BORING LOCATION
○ D3	FORMER DRUM/MISCELLANEOUS CONTAINER LOCATION AND DESIGNATION
▣ VEW1	VAPOR EXTRACTION WELL LOCATION
+ FB4/ VP2	SOIL SAMPLE LOCATION/VAPOR PROBE LOCATION

NOTES:

1) All locations and dimensions are approximate.
2) Base map from Proposed Site Assessment, Former Mondo Chrome Facility, by Fugro West, Inc., project no. 94-48-1320, dated August 1994, and field observations made by FREY Environmental, Inc. July 1996.

NORTH

0 10 20

SCALE IN FEET

FORMER MONDO CHROME FACILITY
4933 FIRESTONE BOULEVARD
SOUTH GATE, CALIFORNIA

Client: TEDESCO LEASING Project No.: 172-01

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SITE SKETCH SHOWING
SOIL SAMPLE, VAPOR EXTRACTION WELL,
AND VAPOR PROBE LOCATIONS

Date: JULY 1996 Figure 2

172D1-2.DGN